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Adding Value to Fruits and Vegetables: Know the Risks

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Adding Value to Fruits and Vegetables: Know the Risks

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Local growers are looking to expand their customer base; they seek the opportunity to have a greater portion of their revenues derived from "value-added" activity. Value-added activities often involve food processing or the manufacturing of a local commodity (e.g., pickles, jams and jellies, salsa, whole grain breads). Growers considering adding value-added products to their business have questions about regulations, as well as about food handling practices that reduce or eliminate possible health and safety risks.

Canning is the process of placing products into a container (usually a jar), sealing the container, and then treating it with high heat either alone or in combination with pressure, pH, water activity (a_w), and/or other chemicals to render the food "commercially sterile" or "shelf stable." Canned product is free of viable microorganisms of public health significance (such as ***Clostridium botulinum*** [*C.botulinu*] – a living organism which is almost universally present).

C. botulinum can grow in foods and produce a powerful toxin which affects the nervous system if the following favorable conditions exist:

- packaged in the absence of oxygen
- pH of 4.6 or higher
- warm temperature (40 to 140°F)
- contain high moisture (Aw .85 to 1)
- nutrients necessary for its growth (proteins and/or carbohydrates)

Categories of canned foods are based on the pH level of the food. Food acidity is measured by pH. The pH scale runs from 1 to 14. A pH of 1 is extremely acidic, 14 is very alkaline, and 7 is neutral (distilled water).

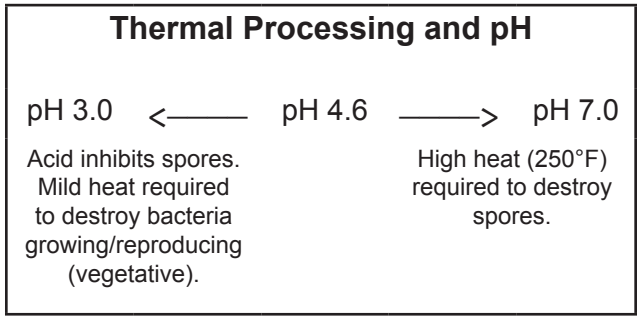
- **Low-acid canned foods (LACF)** – pH is 4.6 or higher. Are at considerable risk for botulism organism growth. They require heat treatment of 240 to 250°F for a specific amount of time to destroy the *botulinum* organism.
- **Acidified low-acid foods** – pH is 4.6 or lower. An acid or acid food has been added so that every component of the food reaches pH 4.6 or lower within 24 hours after thermal processing.
- **Acid foods** – natural pH of 4.5 or lower. Natural pH controls bacterial growth. Molds can grow at a pH below 4.5. Molds are capable of consuming acids and raising the pH to a level that allows *C. botulinum* to grow.

Foods	pH Range
Lemon Juice	2.0 – 2.6
Apples	3.1 – 4.0
Cabbage	5.0 – 6.75
Cucumbers	5.12 – 5.78
Saurkraut	3.3 – 3.6
Apricots	3.3 – 4.0
Tomatoes	4.3 – 4.9
Peaches	3.3 – 4.05
Asparagus	6.1 – 6.7
Baby corn	5.2
Basil pesto	4.9
String beans	5.6
Green peppers	5.2 – 5.93
Plums, yellow	3.9 – 4.45
Potatoes	5.7
Raspberries	3.22 – 3.95
Rhubarb	3.1 – 3.4
Strawberries	3.0 – 3.9
Find a more complete list at http://vm.cfsan.fda.gov/~comm/lacf-phs.html.	

Moisture of food is expressed by water activity (A_w). Water activity (A_w) in food is a measurement of the water available for the growth of microorganisms. A_w ranges from 0 to 1 (distilled water is A_w1). For more information on water activity, visit the following website: http://www.fda.gov/ICECI/Inspections/InspectionGuides/InspectionTechnicalGuides/ucm072916.htm.

Thermal (heat) processing is needed to destroy spoilage and pathogenic microorganisms. Thermal processing is accomplished with a boiling water bath or pressure canning.

- Boiling-water bath
  - o This process will destroy most organisms of concern, including mold and yeasts that cause spoilage. However, while the boiling water bath maximum temperature of 212°F will destroy mold and yeast organisms, it will not destroy the *botulinum* organism. The boiling water bath is used to process high acid.
- Pressure canning
  - o This process will destroy the *botulinum* organism and is the recommended processing method for low-acid products. The temperature in the pressure canner is capable of reaching 240 to 250°F. Direct marketing low-acid canned foods requires following additional Food and Drug Administration regulations.
- In some instances, depending on the type of facility, a hot fill in sterilized jars with aseptic packaging is allowed.



MORE INFORMATION

For general information on the processes of boiling water bath canning and pressure canning, contact the following:

- County Extension office – http://sdces.sdstate.edu/ces_website/county_offices_bottom.cfm
- SDSU Food Safety Extension Specialist Joan Hegerfeld-Baker – joan.hegerfeld@sdstate.edu, (605) 688-6233

Or visit one of the following websites:

- National Center for Home Food Preservation – http://www.uga.edu/nchfp
- South Dakota State University Cooperative Extension Service, Food Safety home page – http://extfcs.sdstate.edu/foodsafetysite/index.cfm

USEFUL WEBSITES

- Starting a Food Business, FDA – http://vm.cfsan.fda.gov/~comm/foodbiz.html
- Preparing a business plan: a guide for agricultural producers – http://www.agf.gov.bc.ca/busmgmt/bus_guides/direct_guide.htm
- Food Entrepreneur Resources, Penn State – http://foodsafety.cas.psu.edu/processor/resources.htm#Tech
- Food Entrepreneur Resources, North Dakota State University – http://www.ag.ndsu.edu/foodent/entrpnr.htm

SOURCES

Center for Food Safety and Applied Nutrition. Approximate pH of foods and food products. FDA April 2007.

FDA Requirements for Establishment Registration, Thermal Process Filing, and Good Manufacturing Practice for Low-Acid Canned Foods and Acidified Foods. A compilation of Title 21, Code of Federal Regulations, Parts 108, 113, and 114. May 1997. http://www.cfsan.fda.gov/~lrd/lacfregs.html.

Shafer, B., C. Balestrini, and L. Weddig. Canned Foods Principles of Thermal Process Control, Acidification and Container Closure Evaluation. Washington DC, GMA Science and Education Foundation. 2007. ISBN 978-0-937774-58-8.

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